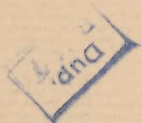


Holmes



LIBRARY.  
SURGEON GENERAL'S OFFICE

AUG 10 1910

859

AURAL COMPLICATIONS OF  
TYPHOID FEVER.

---

By EDGAR M. HOLMES, M.D.  
OF BOSTON.

Read at the Annual Meeting of the Massachusetts Medical Society,  
June 8, 1897.



## AURAL COMPLICATIONS OF TYPHOID FEVER.

---

THAT various ear lesions are comparatively common and often serious complications, not only in the eruptive diseases but also in typhoid fever, is a fairly well recognized fact among practitioners in general; a careful analysis, however, of the aural complications of these febrile diseases has been made by a few observers only.

In order to ascertain the frequency, the various pathological conditions and the final results, with or without treatment, of the various aural complications of typhoid fever, while aural house officer to the Boston City Hospital, in the service of Drs. J. Orne Green and George A. Leland, I examined the ears of two hundred and thirty-four typhoid fever patients. None of this number were in any way selected, and only those too sick to undergo an examination or give correct answers were omitted.

Each case was given the following examination: a record was made of the conditions found in the nose, throat, external auditory canal and membrana tympani. At every examination the temperature, as well as the mental condition of the patient, was taken and recorded for the influence they might have upon the aural conditions; and the majority of the cases were examined every second day while they remained in the hospital. I have also been fortunate in finding fourteen of the most interesting cases and examining them at their homes since their recovery from the typhoid.

Some others, although presenting interesting features which would be of considerable value to me, I have been unable to locate as they have removed from their residence as given in the hospital records. The following hearing tests were always made: 1st, the hearing distance for the watch; 2d, the hearing distance for Politzer's accumulator; 3d, the intensity and duration as recorded by Hartmann's set of five forks, C128, C256, C512, C1024, and C2048 vibrations per second; 4th, the Rinne test (the relative intensity of air to bone conduction); 5th, Galton's whistle; and 6th, in high grades of deafness a whispered voice test was made, but this as well as some of the other tests were made somewhat difficult as they were conducted in the general wards which were at times somewhat noisy.

Of the two hundred and thirty-four cases examined eighteen, or about 7%, had otitis media acuta when first examined; in five the right, in seven the left, and in six both ears were affected. Of these twenty-four acutely inflamed middle ears, six showed bulging of the membrana tympani, with more or less pain, at the first examination, and I performed immediate paracentesis. A serous discharge followed in five instances, and one was followed by a thick stringy pus. Four of the cases with a serous discharge were immediately relieved of their distressing symptoms; in two the discharge ceased within twelve hours, one closed within forty-eight hours and one in seventy-two hours. The other case became purulent upon the second day and finally developed a mastoiditis, which subsided after free paracentesis and the application of Leiter's coil and leeches. This case, which developed mastoiditis, had been suppurative about eighteen months previously, at which time the patient was supposed to have pneumonia. This was the first time the ear had been diseased and the discharge lasted about five weeks. Two of the cases in this series had a drop in temperature from 103.5 and 102 to 99 and 98.4 respectively within



twelve hours after the paracentesis, which might suggest that the middle ear inflammation had something to do with the pyrexia. Both of these patients had been sick some time when they were admitted to the hospital. One gave a history of having been sick several weeks, and after having nearly recovered was taken suddenly worse. She had had a stuffy feeling in her ear for a day and a half before the last attack. She made a rapid recovery after getting relief from her ear trouble, her temperature never rising above 99.2 after the first twelve hours following paracentesis. The other case was that of a man who had been for some time, until two days before admission to the hospital, able to be up and about the house. He gave a history of feeling a "snap" in the left ear while blowing his nose forty-eight hours before entering the hospital. The following day there was a stuffy feeling in his ear. He felt poorly and called his attending physician, who, after finding him with a high temperature, advised his admission to the hospital. He told patient he believed he had a relapse and was liable to be sick for some time. Examination showed the left membrana to be bulging. A bleb the size of a large pin head was situated just in front of the manubrium. I incised this bleb and made an opening through the membrana in the posterior inferior quadrant. The temperature, which was 102.8, was 98.5 the following morning and did not go above 99 afterward. He was discharged well at end of six days.

I always performed paracentesis under strictly aseptic precautions, and inserted a loose antiseptic wick in all serious cases. Those cases which discharged pus were syringed with corrosive solution (one to five or six thousand) every three hours if the secretion was thick in consistency and considerable in amount. When the secretion was such as to flow fairly freely the douche was used only morning and night. These cases I always gave personal attention at

least twice a day and dressed the serous cases myself. However, four of the serous cases became purulent and I had to resort to the douche.

Of the remaining twelve cases in this series one came to paracentesis and quickly subsided, four ruptured spontaneously although there was never a longer period than twenty-four hours between examinations, showing how quickly an acute ear, which seemingly does not demand surgical interference, may become so severe as to rupture the membrana tympani. Of those which ruptured spontaneously, three discharged pus and one only discharged serum. The one which discharged serum healed in five days, one which was suppurative died of the typhoid, one healed in eleven days, and the other left the hospital with suppurative ears although they received constant care while in the hospital. The nine remaining cases in this class recovered without rupture of the membrana and present nothing of especial interest.

Twenty-one, or about 9 per cent., developed otitis media acuta while in the hospital. Eight of this number were or became purulent. Six gave either a history or showed signs of a previous middle ear suppuration. Eleven cases developed during convalescence with a rise of temperature ranging from 100 to 104.5, and as a rule without or with very little pain; only five, so far as I know, complained of the ear when questioned in particular in regard to it. I made it a point to examine the temperature charts of the typhoid fever patients every day, as I usually examined the ears of only a portion in a ward at one time. I visited each medical ward every day, and was therefore able to early detect quite a large number of acute middle ear inflammations by examining the ears whenever there was a sudden rise of temperature. The house physicians also kindly co-operated with me and were of great assistance in reporting cases of rising temperature for which they could find no apparent cause. I am at present unable to explain

why so many during convalescence, with fairly clear minds, should develop acute otitis media with slight if any pain, which is so constant a symptom in most other cases. During the great nervous and mental depression at the height of the fever it seems not at all strange that the pain should not be noticed, as other stimuli may cause only slight if any impression; but many cases during convalescence developed severe inflammation of the middle ear, and even of the mastoid without complaining of pain.

Twelve of the 21 cases in this series either showed bulging of the membrane or later developed it, and paracentesis was performed. A serous discharge followed in eight cases and a purulent discharge in four. Two of the eight serous cases afterward became purulent, three were closed within twenty-four hours, two discharged a sero-sanguineous fluid for several days, and one died from intestinal hemorrhage within six hours after paracentesis. Three cases ruptured spontaneously, although I had examined them within twenty-four hours and had found no apparent bulging.

Of the four cases which were purulent at the time of paracentesis one healed on the fifth day, one ceased to discharge by the seventh day, one continued to grow worse and developed mastoid symptoms. Schrapnell's membrane was found to bulge on the third day after the first paracentesis. A free slitting of this portion of the membrane was followed by several drops of thick stringy pus; after this opening was made I syringed the attic with a 4 per cent. boracic solution every four hours for two days. The temperature dropped and the patient was relieved, all mastoid symptoms subsiding after forty-eight hours. All signs of pus disappeared by the ninth day, and the ear gave no further trouble.

Two of the cases in this class which ruptured spontaneously discharged pus, and one a sero-sanguineous fluid.



The last became suppurative at the end of three days, but ceased to discharge at the end of eight days. There was a perforation in the posterior portion of membrana about one eighth of an inch in diameter. This opening refused to close, although various stimuli as well as aseptic paper discs were used. One of the suppurative cases was healed at the end of eleven days. The other, in which the membrana was perforated at the anterior superior quadrant, just below the anterior fold, would cease to flow for a few hours. There would then be a profuse discharge, preceded by severe pain. I wished to incise the membrana in the posterior inferior quadrant when the first attack of stoppage to flow took place, but the patient refused to have anything of a surgical nature performed. Finally, at the end of five days, after having five or six attacks of severe pain, she consented to allow me to do whatever I thought best. I therefore made a curved incision below and back of the umbo near the periphery of membrana. The original opening closed by the end of three days. A profuse discharge escaped through the incision for five days, when this ceased and the ear was apparently well at the end of nine days.

Seven patients were found to have otitis media suppurativa chronica, and five otitis media suppurativa acuta. The right was involved five times, the left three times, and both four times. Two patients with O. M. S. C., one of seven years' and one of eleven months' duration, were apparently cured of the suppurative process before leaving the hospital; one died of probable intestinal perforation, and four left the hospital with suppurative ears. Three of the cases of O. M. S. A. were apparently cured before leaving the hospital; one remained in the hospital only three days, and the fifth but a week. The patient who remained but three days I afterward treated at the Boston Dispensary. I saw her nearly every day for eight weeks without apparent improvement, when I advised re-



removal of the ossicles, as there was necrosis, and the hearing in this ear was nearly nil. This operation was followed by absolute recovery from the suppurative process. A cicatricial membrane formed and completely protected the middle ear. The hearing, which was so reduced that she could not hear the watch on contact, became five inches for the watch. Six months later the hearing was tested and found not to have changed from that of the last examination.

Twelve, or over 5 per cent., of the whole number of cases gave a history or showed signs of having had suppurations which had healed. In five of these both ears, in three the right, and in four the left ear had been affected.

Two patients had furunculosis of the external auditory canal. In one the right only was affected. In the other both were diseased. In the first case it was difficult, at once, to decide whether we had to deal with a complication of a mastoid with a diffuse external otitis or an external otitis alone. The external canal was very much swollen and filled with pus. There was considerable swelling over the mastoid which was very sore to the touch. There was also some swelling of and about the tragus. The patient complained of marked dizziness with a roaring sound in the ear. Moving the head caused pain, which was located in the neck. Pressure over this area did not cause pain. The temperature was 102.3, but this was of little help, in this case, as it had remained at about this height for over a week before there were any symptoms of ear trouble. Upon the second day a furuncle had sufficiently developed to be incised and the swelling in front of the ear was greatly increased, while that over the mastoid was not so marked. As many as a score of points developed within the next three weeks. Seven of these were opened with the knife. At the end of six weeks there were no marks of the trouble remaining. The membrane was not affected and the hearing was normal.

Eleven patients had or developed a mastoiditis marked by bulging of the posterior walls of the external auditory canal, more or less swelling of the peri-mastoid tissues and tenderness over the mastoid region with more or less pain. Quite a number of others complained of some soreness about the mastoid, but as they showed no other symptom of mastoid inflammation at any time I have not included them with the cases of mastoiditis. Three of these mastoid cases resisted all palliative treatment, free paracentesis of the membrana tympani, leeching over mastoid region, Leiter's coil, etc., and came to the operation of trephining. One case, which I shall later report more fully, was admitted as typhoid, but was found after a more careful examination to have very severe mastoid symptoms, and to have a general septicæmia from a probable thrombosis of the lateral sinus or subdural abscess. After consultation it was not thought best to give ether and operate, as it was feared he would not survive the operation. He died the same afternoon and no autopsy could be obtained. One case, which was counted among the six purulent cases which followed paracentesis, developed a mastoid inflammation which subsided by the use of the usual antiphlogistic treatment, and another resisted all palliative treatment, both ears were purulent and both mastoids affected, the right side being very œdematous. The physical condition of the patient was so reduced from the long course of the typhoid that it was not thought advisable to etherize and operate. Everything which seemed possible was done for the patient, and at the end of a week he had sufficiently rallied to undergo an operation. The right mastoid was found to be very necrotic. There was an abscess in the digastric fossa which contained about three ounces of foul pus. After the operation the patient made a slow but perfect recovery.

This acute inflammation of the mastoid usually lasted only two or three days. A number of cases were relieved

within twenty-four hours by the use of Leiter's coil, the application of leeches, and more thorough opening the membrane, when the discharge was found to be thick and to plug the original opening.

There were sixteen patients who, at some time during their disease, developed more or less marked deafness both to air and bone conduction, in whom I could find no apparent ear lesion. Some of these, which I will report individually, I examined daily and was able to trace a gradual diminution for several days, after which the hearing remained apparently stationary for a few days. There was then a gradual increase, and finally the hearing was restored to normal. In this series was one man who gradually lost both hearing and sight, although nothing abnormal in appearance in the ear or eye could be found. Both Dr. Wadsworth and Dr. Lancaster examined the eyes and could find no change in the eye structures. Dr. Leland examined the ears with me and could find no apparent pathological condition. There was one other case which also showed diminution of vision with that of hearing, but neither was as marked as in the case just mentioned.

This dulness of hearing must either be due to some obstruction in the external auditory canal, thickening, perforation, calcification, granulation, constricting bands or adhesions of the membrana tympani, reduced pressure in the middle ear due to closure of Eustachian tube, secretions, thickening of the lining membrane of the tympanum, decreased mobility of ossicles, granulations polypi, binding down of foot-plate of stapes, changes in the labyrinth, in auditory nerve, or loss of perception in the auditory centres within the brain. In any obstruction to the sound waves in the external auditory canal or middle ear there is diminution of sound perception by air conduction, but with obstruction in these parts alone the bone conduction is increased in intensity. In these cases the bone conduction



was decreased in about the same ratio as the air conduction. We are therefore, it seems, justified in eliminating affections of the external auditory canal, the membrana tympani and the middle ear, and have to consider affections of the labyrinth, the auditory nerve, and the central nervous system auditory centres. Were the labyrinth affected to such an extent as to produce such marked deafness, we would expect other labyrinthine symptoms as vertigo, tinnitus, nausea, and perhaps vomiting. We would hardly expect to find both sides simultaneously affected and both to the same degree so far as to the loss of hearing. Nor would we expect to find so many cases making a perfect recovery. It would seem that there was some loss of perception somewhere in the auditory centres of the brain, although the diminution of hearing was in many cases out of all proportion to the general existing mental torpor. The two cases which developed a loss of vision simultaneously with that of deafness, in whom no pathological lesion could be found, would also suggest a central origin. As every case which I examined regained normal hearing after a longer or shorter period, ranging from five days to six weeks, and as I have not been able to find any case reported where permanent deafness resulted after "typhoid deafness" of this character, it is of little importance from a practical standpoint just what portion of the auditory apparatus is affected. It is, however, important in all these cases, to eliminate middle ear inflammations which if present should receive appropriate treatment.

I will now report a few cases individually, as I take them from my notes, to more fully illustrate the classes concerning which I have already given a general outline. As is seen, I have simply divided the acute inflammations into four general classes, those which were mild, with only slight if any secretion, those in which the middle ear was distended with secretion, and were relieved by paracente-

sis, those which ruptured spontaneously, the two latter classes being sub-divided into those which discharged serum, those which discharged pus and those which were complicated by an extension of the inflammation into the mastoid cells, producing sufficiently marked signs and symptoms to make a diagnosis possible.

I. L. II. Ward II, bed 9. A well developed male of 20 years, driver of a grocery team. Has been sick three weeks; had mumps when a boy, no other sickness; never had ear trouble until yesterday. The left ear began to feel very full then, and there was an itching in the external canal.

Examination shows temperature of 102.3, pulse 88. Is mentally clear. Patient is lying on right side and breathing through mouth. Nose; right nares, inferior turbinate swollen; it entirely obstructs the air passage. Left nares clear save for a slight spur two-thirds way back on septum. There is considerable thick tenacious secretion about middle turbinate and on floor of this side. The lower turbinate is fairly clear. Naso-pharynx: marked congestion with considerable thick mucous. Pharynx: a glassy red color and very dry. Ears: the right is apparently perfectly normal. The left membrane is much injected about manubrium. The whole membrane being of a pinkish color and very much indrawn. Hearing:

W.	R 16	Rinne	$R_b^a \frac{21 \ 26 \ 34 \ 29 \ 7}{16}$	G.W.	R 1.4.	Web. R<L
L	3		$C \ C^1 \ C^2 \ C^3 \ C^4$		L 1.2.	
			$L_b^a \frac{14 \ 17 \ 20 \ 21 \ 6}{16}$			

Treatment: Cleansed nose and naso-pharynx very thoroughly with Dobell's solution, and painted naso-pharynx, about tubes, with a solution of antipyrine. Patient says the full feeling is much relieved. There is, however, no apparent change in the appearance of the membrana.

Nov. 9th. There has been no change since yesterday, only the hearing in left side has improved. Can hear watch

five inches, and the Rinne is  $\frac{14}{13}$ . The same treatment is continued.

Nov. 10th. No change since yesterday.

Nov. 11th. To-day, as ear seemed to be as much indrawn as at first examination, after carefully cleansing nose and throat with Dobell's solution followed by a solution of boracic acid, I inflated the middle ear by means of the catheter. Patient was immediately relieved of the ringing noise which has caused considerable annoyance for the last few days. The hearing, after inflation, was thirteen inches for the watch and for Rinne  $\frac{28}{14}$ .

Nov. 12th. No ear trouble since yesterday. The ear, in appearance, is the same as the other. Hearing practically the same as yesterday.

Nov. 17th. Ears normal. Naso-pharynx much improved. Hearing is improved in both ears.

Watch	R 23	Rinne	$R_a$	$\frac{27}{15}$	$\frac{30}{15}$	$\frac{36}{15}$	$\frac{31}{15}$	$\frac{7}{15}$	Webber, R=L
	L 20		$C C^1 C^2 C^3 C^4$						
	$L_a$		$\frac{41}{16}$	$\frac{26}{16}$	$\frac{29}{16}$	$\frac{28}{16}$	$\frac{4}{16}$		

Nov. 24th. The last three examinations have shown practically the same conditions as that of Nov. 17th.

Dec. 23d. Nothing else developed while patient was in hospital.

II. C. P., twenty-four years old, was admitted to bed 18, ward 3, August 23, 1894. He had been ailing about one week. Had children's diseases, but remembered no ear trouble.

Examination August 25th. Temperature 101.6. Pulse 92. Seems mentally clear. Nose: save for a slight deflection of septum to the right, both sides are practically normal. Naso-pharynx: could not get clear view of with mirror, as I could not get patient to drop soft palate. Pharynx somewhat congested. Ears: both membrane, except a slight thickening, are normal. Hearing:



Watch R 31 Rinne  $R_b^a \frac{26 \ 31 \ 34 \ 27 \ 7}{16}$  Webber R=L  
L 36  $L_b^a \frac{28 \ 30 \ 31 \ 28 \ 6}{15}$

Galton's whistle 1.5 both.

Aug. 27th. No change.

Aug. 29th. Nose slightly congested. No other change.

Sept. 1, 3, 5, 8, 10, 12 and 15. No change.

Sept. 17th. Complains of stuffing of nose. Both turbinates are congested. Gave Dobell's solution to sniff up nose from a saturated pledget of absorbent cotton. Both membranæ are indrawn and injected. There has been no pain, but the hearing is reduced for the watch to nine inches

for right and six inches for left ear. Rinne  $R_b^a \frac{1 \ 8}{16}$   
 $L_b^a \frac{2 \ 7}{17}$

Sept. 20th. Can see very little change since yesterday.

Sept. 21st. Cannot hear watch. Both membranæ are very much injected but there is no bulging. There is no pain.

Sept. 22d. There is injection of the membranæ. No other change.

Sept. 24th. The hearing is somewhat improved. No change of membrane.

Sept. 26th. The hearing is nearly equal to that of first examination. The membranæ are now only slightly injected. The nose and throat are much improved. The Dobell's solution is continued.

Sept. 30th. Both ears have apparently recovered their normal condition. The hearing is:

Watch R 34 Rinne  $R_b^a \frac{28 \ 30 \ 35 \ 27 \ 7}{16}$  Webber R=L  
L 39  $L_b^a \frac{29 \ 32 \ 31 \ 27 \ 7}{15}$

III. T. C., an emaciated man of twenty-five years, was admitted three days ago to ward T, bed 4. Has been sick

about four weeks. Began to have some pain in throat to-day. Says he has been hard of hearing for the last day or two.

Examination Sept. 21st, 1894. Temperature 103. Pulse 94. Mind clear. Nose: both sides congested and both nares contain considerable secretion which has formed crusts anteriorly. Patient is breathing through mouth. Naso-pharynx and pharynx both severely congested. Ears: right, normal; left, whole membrane is of a dark red color and is bulging. Hearing:

$$\begin{array}{lcl} \text{Watch} & \begin{array}{l} R \ 18 \\ L \ 1 \end{array} & \text{Rinne} \end{array} \quad \begin{array}{l} R_b^a \frac{21 \ 24 \ 23 \ 20 \ 6}{C \ C^3 \ C^2 \ C^3 \ C^4} \\ L_b^a \frac{5 \ 8 \ 11 \ 4 \ 2}{16} \end{array} \quad \text{Webber } R < L$$

I performed paracentesis, which was followed by a serous discharge. Inserted a corrosive wick. Three hours later changed wick, which was soaked with secretion.

Sept. 22d. Changed wick every three hours to-day. There is a profuse discharge. The temperature has dropped to 98.8.

Sept. 23d. There is no discharge to-day, and paracentesis opening is apparently closed. Powdered with boric acid and placed corrosive wick in meatus. The temperature is 99.

Sept. 25th. The membrane is still somewhat injected, but there is no discharge. The hearing for watch is ten inches in left ear. Rinne for  $C_b^a$  18.

Sept. 27th. Nothing save a reddish line at position of incision remains to show that there has been an inflammation in ear.

Sept. 30th. Patient was to-day discharged from the hospital. The hearing has gradually improved, and for to-day was:

$$\begin{array}{lcl} \text{Watch} & \begin{array}{l} R \ 26 \\ L \ 28 \end{array} & \text{Rinne} \end{array} \quad \begin{array}{l} R_b^a \frac{26 \ 31 \ 33 \ 27 \ 6}{C \ C^3 \ C^2 \ C^3 \ C^4} \\ L_b^a \frac{25 \ 36 \ 35 \ 31 \ 7}{15} \end{array} \quad \text{Webber } R = L$$

IV. P. McD., well developed male twenty-one years old. Past history good. Has been sick about two weeks. Admitted to ward K, 21, yesterday. There has never been any ear trouble.

Oct. 25th, 1894. Examination: nose and naso-pharynx practically normal. Ears both normal. Temperature 99.6. Hearing:

W. R 33 Rinne  $R_b^{a \frac{24 \ 27 \ 28 \ 23 \ 6}{C \ C^1 \ C^2 \ C^3 \ C^4}}$  G.W. R 2.1 Web. R=L  
L 36  $L_b^a \frac{21 \ 26 \ 29 \ 24 \ 5}{13}$  L 1.8

Oct. 27th. No change.

Oct. 29th. Nose is somewhat inflamed. Gave Dobell's solution.

Oct. 31st. Nose is much better. Ears same as at first examination.

Nov. 2d. No apparent change.

Nov. 4, 6 and 9. No change.

Nov. 11th. To-day there is a sudden rise of temperature to 103.2. Patient complains of stuffy feeling in right ear. The hearing for watch is reduced to three inches in this ear. Upon examination the membrana is found very much inflamed and bulging. Paracentesis was followed by a few drops of pus. I placed a corrosive wick, but three hours later the discharge was so thick that I substituted the douche every three hours.

Nov. 12th. The discharge is very thick and profuse and hearing is only one inch for watch. The temperature has fallen to 99.6, which is about the same temperature as that before the ear trouble began.

Nov. 13th. No apparent change since yesterday.

Nov. 14th. The discharge is much less than it was, and is not so thick. Ordered the douche night and morning.

Nov. 15 and 16. Slight, if any change.

Nov. 17th. The discharge is now slight, and the douches are discontinued. I thoroughly cleansed ear and slightly powdered with aristol and boracic acid.



Nov. 18th. There is still a slight discharge. The external canal being simply moist. Same treatment as yesterday.

Nov. 19th. The ear was perfectly dry this morning, but hearing is only two inches for watch and for fork.

Rinne  $\overset{512}{619}$ .

Nov. 25th. The last two examinations have been the same as the last report. To-day I inflated ear with catheter and obtained thirteen inches for watch. Rinne  $\frac{512}{619}$  for C<sup>2</sup>.

Nov. 28th. The right membrana is found to be indrawn and I again inflated with very little improvement in hearing since last note.

Dec. 1st. Hearing to-day was practically that of the first examination. The membrana was normal in appearance. The patient was discharged from the hospital to-day, having recovered from the typhoid.

V. M. L., a young unmarried woman of twenty-five years, with a large frame, but emaciated. Says she has not eaten for four weeks save a little beef tea and gruel. Was admitted to hospital six days ago, but through some oversight I saw her for the first time to-day.

Sept. 27th. Examination. Nose: right naris considerably obstructed by a large spur. The middle turbinate is more spongy than normal. The left side of septum is indented at position opposite the spur in right side. The inferior turbinate is hypertrophied. There is also a hypertrophy of the naso-pharynx. The tonsils are large and follicular. Ears: both membrane present about the same appearance, viz.: prominent posterior fold. Prominent short process of malleus, and a very narrow light reflex. No acute process is to be made out. Hearing:

W. R  $\frac{14}{5}$  Rinne  $\overset{R^a}{L^a} \frac{17 \ 20 \ 24 \ 19 \ 5}{\frac{17}{17} \ \frac{20}{20} \ \frac{24}{24} \ \frac{19}{19} \ \frac{5}{5}}$  G.W.  $\frac{R \ 1.4}{L \ 1.2}$  Web. R<L

Sept. 29, Oct. 1, 3, 5, 7 and 10. No change.

Oct. 12th. To-day right ear is injected. There is no pain or any other ear symptom.

Oct. 13th. Was surprised to find the right ear discharging a bloody serum to-day, as it had only been thirteen hours since the last examination when there was no bulging and only slight inflammation apparently. The patient has had no pain, and has complained of no ear symptoms. The hearing is 0 for watch in right ear. Not changed in left.

Oct. 14th. The discharge is very profuse but remains serous in nature. Corrosive wicks are inserted every three hours.

Oct. 15th. Until to-day I have been unable to see the perforation. It is now easily made out in anterior quadrant, just in front of umbo. It is about the size of a medium pin head. The ear is discharging profusely. Patient complains of pain in occipital region, but I can find no cause for it.

Oct. 16th. There is no pain. The discharge is about the same.

Oct. 17, 18, 19 and 20. No change.

Oct. 21st. The discharge is less to-day. There is no change in the hearing either for the watch or the tuning forks.

Oct. 22d. There is fully as much discharge to-day as there was at first. There are no serious symptoms.

Oct. 24th. Since yesterday there has been only a slight discharge. Was able to hear the watch to-day, at a distance of one inch, in the right ear. The left ear has maintained normal hearing throughout.

Oct. 26th. To-day external canal is dry. The perforation remains about the same size. The hearing is :

Watch	R 3	Rinne	$R_b^a$	14	13	19	15	5
	L 7		$C$	$C^1$	$C^2$	$C^3$	$C^4$	
			$I_b^a$	16	18	23	17	6

Nov. 1st. No change since last note.

Nov. 5th. The last two examinations show no marked change in appearance or hearing. The perforation is slowly granulating.

Nov. 8th. Perforation entirely closed. Hearing not changed.

Nov. 11th. To-day hearing for watch was nine inches before inflation and fourteen inches after. Middle C fork before  $2\frac{1}{2}$ , after  $2\frac{1}{2}$ .

Nov. 15th. Patient was discharged from hospital to-day. There had been very little change in the last three days.

VI. M. R., laboring man, forty-three years old, was admitted two days ago to ward T, bed 6. Has been sick for a few days, and has not been feeling well for two weeks. He has a temperature of 103.7 and the cold sponge baths affect it for a short time only.

Examination August 27th, 1894. Nose: practically normal. Naso-pharynx: normal. Ears: both tympanum apparently normal. Was too sick to make a full hearing test. I simply tested for the watch and this showed about twelve inches for both ears.

Aug. 29th. No change.

Sept. 1st. The hearing is only four inches for the watch in both ears. I could find no other change. The temperature was 101.4°. The mind seemed as clear as at first.

Sept. 3, 5 and 7. Practically no change in patient.

Sept. 9th. Temperature still remains high, but can hear watch at distance of eight inches.

Sept. 11th. There is considerable improvement in general condition and I made a thorough examination to-day. The nose and throat are considerably congested. Patient breathes mostly through mouth. There is no change in appearance of ears. Hearing:

W.	R 11	Rinne	$\begin{array}{ccccccc} R_8 & 25 & 22 & 23 & 21 & 6 \\ 1 & 1 & 1 & 1 & 1 & 1 \\ L_8 & 2 & 2 & 2 & 2 & 2 \end{array}$	Q.W.	R 2.3	Weh. R=L
L	8			L 2.3		



Sept. 13th. No material change.

Sept. 15th. For last day there has been a heavy feeling in right ear. No real pain. There is a beating noise. The membrana is indrawn and the manubrial plexus is injected.

Sept. 16th. The ear snapped this morning like the report of a pistol. This was immediately followed by a discharge of "bloody matter" from the external canal. I found canal of right side filled with pus four hours after rupture. The rupture is an irregular one, just back of umbo. Syringed every three hours with solution of corrosive (1 to 6000).

Sept. 17th. The discharge is very profuse. The perforation seems much larger than it did yesterday. Same treatment.

Sept. 18, 19 and 20. No change.

Sept. 21st. The perforation is undoubtedly larger than it was three days ago. It is as large as a grain of wheat.

Sept. 22d. There is a bulging of the posterior wall of the canal and tenderness over the mastoid antrum. Applied two leeches over mastoid and ordered a Leiter's coil applied.

Sept. 24th. The mastoid inflammation has apparently subsided. The ear still discharges profusely. The discharge is very thick.

Sept. 25, 26 and 27. No change.

Sept. 28th. The discharge is slightly less in amount.

Sept. 30th. There is an increase in the amount of discharge.

Oct. 3d. The discharge is much less. The left ear has remained normal. The hearing in the right has been from one-half to one and one-half inches.

Oct. 5th. There was only slight discharge to-day, and the douche was discontinued. The perforation is much smaller.

Oct. 7th. The discharge has ceased. The hearing is :

W. R 7      Rinne  $R_b \frac{15 \ 17 \ 18 \ 20 \ 5}{c \ c^2 \ c^2 \ c^2 \ c^2}$       G.W. R 1.8      Web. R>L  
           L 8       $L_b \frac{21 \ 22 \ 25 \ 26 \ 5}{10}$

Inflation did not change hearing.

Oct. 10th. I again inflated ear to-day and hearing was one inch for watch.

Oct. 15th. The perforation is nearly closed. The hearing is same as last note. Patient left hospital to-day.

April 8th, 1895. Examined patient at his home and found he could hear in the poor ear five inches. The

Rinne was  $R_b \frac{27 \ 24 \ 25 \ 26 \ 4}{c \ c^2 \ c^2 \ c^2 \ c^2}$ , No Webber. The membrana  
 $L_b \frac{23 \ 22 \ 23 \ 21 \ 4}{9}$

is considerably distorted by a dense cicatrix.

There are no ear symptoms.

VII. J. C., a short, muscular Italian, nineteen years old, was admitted to ward K, bed 10-2, yesterday. He is supposed to be at about the beginning of the third week of typhoid fever.

Sept. 23d, 1894. Examination. Temperature 102.8. Pulse 94. The hearing tests are very unsatisfactory, as patient answers yes to everything. Nose : normal. Nasopharynx : normal. Pharynx : congested. Ears : both normal.

Sept. 5th. It is absolutely impossible to make a hearing test.

Sept. 8, 11, 14 and 16. No change.

Sept. 19th. The right membrana is indrawn. Cleansed nose and naso-pharynx with Dobell's solution and then painted the naso-pharynx with solution of antipyrine.

Sept. 20th. Apparently the membrana has returned to normal position.

Sept. 22d. The nose and throat are much improved.

Sept. 24 and 27. No change.

Sept. 30th. Both membrana are indrawn and the right is congested. Given the same treatment as upon the 19th.

Oct. 1st. Ears are better. Nose and throat about the same.

Oct. 3d. There is more congestion of the right ear.

Oct. 4th. The membrana of right is bulging, also posterior wall of external canal is swollen. The mastoid is sore to pressure. Paracentesis was followed by serum. Applied leeches and Leiter's coil.

Oct. 5th. Mastoid symptoms have subsided. There is no discharge from ear.

Oct. 7th. Improving.

Oct. 10th. The left ear is considerably inflamed. The patient's general condition is very poor. He has a continued high temperature.

Oct. 12th. No change.

Oct. 15th. There is again a mastoid inflammation on the right side. The membrana has ruptured and is discharging pus. The left ear is somewhat improved.

Oct. 16th. There is considerable swelling of mastoid. The leeches and cold coil seem to produce no effect. Had a temperature of 104.2 this morning. Dr. Leland saw patient with Dr. Mason and Dr. Post and they were all of the opinion that patient would not survive an operation. I freely incised the membrana and substituted hot water bag for ice coil.

Oct. 17 and 18. Practically no change.

Oct. 20th. The general condition is better. The ear discharges profusely, and is syringed every three hours.

Oct. 22d. The left mastoid has become inflamed. Paracentesis was followed by pus. Applied Leiter's coil.

Oct. 23d. No change in right side. Left side much better.

Oct. 25th. Dr. Leland operated upon right mastoid to-day. The whole mastoid was infected. The lateral

sinus was exposed and covered with granulation tissue. The sinus contained normal blood. A sinus was followed downward and backward into the digastric fossa where an abscess cavity was found, containing foul pus. Another opening was made from below into this cavity, in order to better drain it. The wound was dressed in the usual manner.

Nov. 1st. Patient has done nicely since operation. He feels very hungry but has only typhoid diet. Dressed wound.

Nov. 6th. Wound again dressed. It is granulating very fast.

Nov. 13th. The lower abscess cavity has closed. Was given solid food, as temperature has been normal for two weeks. Left ear entirely well.

Nov. 16th. Complained of pain in right ear to-day. I removed dressing and could find no cause for pain. The wound is fast filling in.

Nov. 23d. Is up and about ward. Has had no more pain.

Nov. 30th. The wound has entirely healed and patient was discharged well. The hearing was:

Watch	R 4	Rinne	R <sub>b</sub> $\frac{7}{8}$
	L 12		C <sup>2</sup>
			L <sub>c</sub> $\frac{7}{8}$

VIII. H. W., a well developed and nourished young man, twenty-two years old, has been sick about ten days, and at present has a temperature of 102.8. He is given frequent baths but it is impossible to keep temperature below 102.

Examination Sept. 18, 1894. Nose: the whole Schneiderian membrane is considerably congested. Naso-pharynx: membrane covered with a thick, tenacious secretion. Ears: both normal. Hearing:



W. R. 34 Rinne 
$$\begin{array}{c} R_b^a \frac{28 \ 33 \ 38 \ 24 \ 7}{15} \\ C \ C^1 \ C^3 \ C^3 \ C^4 \\ L_b^a \frac{25 \ 31 \ 34 \ 26 \ 7}{14} \end{array}$$
 G.W. R 1.4 Web.R=L  
L. 37 L 1.4

Sept. 20th. Is very sick. Pulse is 115. Temperature 103. I simply examined the membranæ, which were normal.

Sept. 22, 24 and 26. Patient too sick to examine for hearing. Membranæ both normal.

Oct. 1st. Tested hearing to-day, for the first time since first examination, and found practically no change.

Oct. 3, 5, 7 and 10. No change.

Oct. 13th. No change in appearance, but hears watch only twenty-three inches in right and twenty-four inches in

left. Rinne 
$$\begin{array}{c} R_b^a \frac{23}{14} \\ C^2 \\ L_b^a \frac{28}{13} \end{array}$$

Oct. 15th. I can find no pathological condition, but hearing is 17 inches in both ears. Complains that for the last two days has not been able to see distinctly.

Oct. 16th. Hearing is reduced more than yesterday, hearing only seven inches for watch. Cannot see as well as yesterday. Dr. Lancaster examined the eyes with me and could find nothing abnormal.

Oct. 17th. Can hear watch only three inches. Cannot tell watch from knife when held two feet from eyes.

Oct. 18th. Cannot hear watch in either ear.

Rinne 
$$\begin{array}{c} R_b^a \frac{7 \ 11 \ 13 \ 9 \ 3}{6} \\ C \ C^1 \ C^2 \ C^3 \ C^4 \\ L_b^a \frac{8 \ 10 \ 12 \ 10 \ 3}{5} \end{array}$$

Dr. Wadsworth examined eyes and could find no cause for loss of vision. Can count fingers, and that is about all.

Oct. 19th. Cannot hear watch. Can be made to understand by shouting into ear. Can only distinguish between light and darkness.

Oct. 20, 21 and 23. No apparent change in either hearing or sight.

Oct. 25th. Could hear watch about one inch in both ears. Could determine no change in vision.

Oct. 27th. Slight improvement in both ears since last note. Can count fingers with both eyes.

Watch	R 3	Rinne	$R_b^a$	$\frac{10 \ 13 \ 15 \ 11 \ 4}{7}$
	L 3			C C <sup>1</sup> C <sup>2</sup> C <sup>3</sup> C <sup>4</sup>
			$L_b^a$	$\frac{11 \ 13 \ 16 \ 12 \ 4}{7}$

Oct. 29th. Can hear

Watch	R 5½	Rinne	$R_b^a$	$\frac{13 \ 15 \ 18 \ 12 \ 4}{8}$
	L 6			C C <sup>1</sup> C <sup>2</sup> C <sup>3</sup> C <sup>4</sup>
			$L_b^a$	$\frac{14 \ 15 \ 19 \ 13 \ 5}{8}$

I have tried Galton's whistle at every examination, but the results have been very unsatisfactory, as the hearing has been so reduced that he could only hear the shrill tones.

Oct. 31st. No material change since last note.

Nov. 2d. Hears watch about ten inches in both ears. Can apparently see better than at last trial.

Nov. 4th. Could distinguish between spoon and knife held at three feet from eyes. This is the first time he has been able to distinguish objects since the loss of vision. Says he can see better every day. The hearing was:

Watch	R 11	Rinne	$R_b^a$	$\frac{14 \ 15 \ 21 \ 14 \ 5}{9}$
	L 12			C C <sup>1</sup> C <sup>2</sup> C <sup>3</sup> C <sup>4</sup>
			$L_b^a$	$\frac{15 \ 17 \ 22 \ 14 \ 5}{10}$

Nov. 8th. Hears

Watch	R 14	Rinne	$R_b^a$	$\frac{15 \ 18 \ 23 \ 15 \ 5}{10}$
	L 14			C C <sup>1</sup> C <sup>2</sup> C <sup>3</sup> C <sup>4</sup>
			$L_b^a$	$\frac{16 \ 19 \ 25 \ 16 \ 5}{10}$

Hears all conversation. Said to-day, that while he could neither see or hear, his mind seemed fairly clear to him, but he had the feeling that he was shut out from the world.

April 13th. No apparent change.

Nov. 16th. Hears watch right sixteen inches, and fifteen inches in left. Could read coarse headings of newspaper.

Nov. 22d. No change the last few days. Patient is about ward, and so seems to be getting strong and to be gaining flesh.

Nov. 27th. Hearing for watch is twenty inches in both ears.

Nov. 29th. Patient has been discharged from hospital.

March 18, 1895. Saw patient at his home, and found vision in both eyes to be  $\frac{20}{15}$ . Can read without any trouble. Hearing is the same as when I first examined him in the hospital.

This report shows that there were thirty-nine patients of two hundred and thirty-four who at some time during their stay in the hospital had acute inflammation of the middle ear. That nineteen were so severe as to produce bulging or membrane at first examination, or later became so, and demanded paracentesis, which was followed in fourteen cases by a serous, and in five cases by a purulent discharge; that seven ruptured spontaneously being followed five times by pus and only twice by a serous discharge; that eleven patients had mastoid inflammation, yielding to ordinary treatment in seven cases, demanding operation in three, and one dying before operation could be performed. That five patients were found to have otitis media suppurativa acuta, and that eleven developed it while they remained in the hospital. That seven had otitis media suppurativa chronica of long standing, two of which were cured by removing old granulation tissue from middle ear and cleansing with corrosive solution. That sixteen cases of deafness occurred without any apparent ear lesion, and that two of these cases also developed a gradual loss of vision. Every case of this form of deafness recovering normal hearing, and the two with visual changes recovering both hearing and sight.

The marked contrast in the course of the inflammation in those cases which ruptured the membrana, and in those



which were relieved by paracentesis, is very apparent. The average duration of discharge after paracentesis was about five days, several healing within twelve hours. Those which ruptured spontaneously not only discharged for a longer period, but left more destruction of the membrana, and were more frequently followed by mastoid complications. There was not a case where paracentesis was performed where the opening in membrana did not close.

Among those which ruptured without interference, there were two permanent perforations, although I did everything I could to prevent this result.

It is also seen that four of the fourteen serous cases became purulent, although I used the utmost care to prevent infection from the external canal. As pus followed five cases of paracentesis, I have reason to believe that those which were apparently serous were already infected through the Eustachian tube, or were later infected through this channel.

If this paper shall impress upon the minds of other physicians, as the research has upon me, the necessity of carefully watching the ears of typhoid fever patients as we now do the pulse and temperature, I believe many and grave ear complications may be interrupted and relieved.